

- Direct ERP actions proposed for the Stanislaus River towards protecting, enhancing, and restoring suitable riparian and associated flood refuge habitats in and adjacent to occupied habitat at Caswell Memorial State Park.
- Develop and implement a monitoring plan to assess populations status and trends.

REFERENCES

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◆ SAN JOAQUIN VALLEY WOODRAT



INTRODUCTION

The San Joaquin Valley woodrat is associated with riparian habitats of the Central Valley floodplain. It has been eliminated from the Delta due to loss of riparian habitat. Elsewhere, the population and distribution of this species has declined substantially, primarily as a result of the loss or degradation of its habitat. The loss of habitat and declining populations have warranted its listing as a California Special Concern species and as an endangered species under the Endangered Species Act. (Federal Register 2000).

The major factor that limits this resource's contribution to the health of the Delta is related to adverse effects of the historical loss and degradation of the mature riparian forests, on which the San Joaquin Valley woodrat depends, in the Delta and San Joaquin River floodplain.

RESOURCE DESCRIPTION

The remaining population of San Joaquin Valley woodrat is restricted to remnant San Joaquin Valley riparian forests with dense brushy understory. Unlike other woodrats, the San Joaquin Valley woodrat occupies riparian forests that have an ample brushy understory within natural floodplains. These floodplain riparian forests must be attached to suitable upland areas for cover and retreat from annual floods. Historically, this species' habitat was

throughout the floodplain on the valley floor in northern San Joaquin Valley, including the Delta, but the original forest and floodplain have been reclaimed, cleared, altered, and degraded.

The remnant population of San Joaquin Valley woodrat is now restricted to 198 acres of remaining native riparian forest along the Stanislaus River in Caswell Memorial State Park and possibly on private property directly across from the Park in southern San Joaquin County in the east San Joaquin Basin Ecological Management Zone. It is considered a sensitive mammal because of its susceptibility to floods, fire, disease, predation, disturbance, and flood control activities. The large-scale loss of riparian forest has resulted in a substantial decline in the woodrats' population from historical levels.

Overall, the decline of the San Joaquin Valley woodrat was caused by the destruction, fragmentation, and degradation of the San Joaquin Valley native riparian forest habitat. Less than 6% of the original habitat remains. Remaining suitable habitat is so severely fragmented that the woodrat has no means of naturally dispersing to other areas and establishing additional populations. Because the remaining San Joaquin Valley woodrat population is known to occur within one small area, any of the following events threaten the remaining populations:

- Caswell Memorial State Park is subject to periodic flooding that often inundates the entire area. Without adequate cover on adjacent upland areas, the woodrats become easy targets for both native and non-native predators.
- The normal buildup of downed logs, dried vegetation, and ground litter in the riparian forest increases the potential severity of wildfires. Although this type of habitat is preferred and typically occupied by the San Joaquin Valley woodrat, any wildfire occurring within the remaining habitat could cause direct mortality as well as massive habitat destruction.
- Human activities have modified the habitat. The modified habitat has "selected" against the San Joaquin Valley woodrat.



VISION

The vision for the San Joaquin Valley woodrat is to contribute to the recovery of this federally listed endangered species through improvement in its habitat to contribute to the overall species richness and diversity.

Achieving this vision will reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

Restoring suitable mature riparian forest, protecting and expanding the existing population, and establishing new populations will be critical to the recovery of the San Joaquin Valley woodrat. Restoration of riparian habitats in the South Delta Ecological Management Unit of the Sacramento-San Joaquin Delta Ecological Management Zone and the East San Joaquin Basin Ecological Management Zone and adjacent upland plant communities will help the recovery of this species by increasing habitat area and providing refuge from flooding. Mature riparian forests with a brushy understory and adjacent upland habitat with sufficient cover during flooding would be suitable restored habitat. A healthy, brushy understory would contain: wild rose, blackberries, elderberries, wild grape, a buildup of downed logs, dried vegetation, and ground litter.

Restoring riparian habitat in the East San Joaquin Basin Ecological Management Zone to expand the area of suitable San Joaquin Valley woodrat habitat adjacent to occupied habitat along the Stanislaus River will help protect and allow the existing population of woodrats to expand. Establishing additional populations within the San Joaquin Valley woodrat's historical range in the Sacramento-San Joaquin Delta Ecological Management Zone would help to avoid potential species extinction. To ensure the survival of introduced populations, newly occupied habitat areas should be suitable only for the San Joaquin Valley woodrat and the riparian brush rabbit.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

A Recovery Plan for Upland Species of the San Joaquin Valley, California has been developed which contains specific measures for the San Joaquin Valley

woodrat (U.S. Fish and Wildlife Service 1998). The California Department of Fish and Game and the U.S. Fish and Wildlife Service should continue the interagency coordination and commitment necessary to halt the further loss and deterioration of habitat and begin restoration and preservation of suitable habitat deemed essential to maintaining the subspecies in perpetuity.

There are a number of programs that involve these species:

- U.S. Fish and Wildlife Service,
- California Department of Fish and Game (DFG),
- California State Parks and Recreation,
- Riparian Habitat Joint Venture.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration and protection of the San Joaquin Valley woodrat is integrally linked with restoration of riparian forests reduction in wildfires and human disturbance in the northern San Joaquin Valley and the Delta.

The San Joaquin Valley woodrat is associated with the riparian brush rabbit in the riparian forests of the upper San Joaquin Valley. The historic range of this subspecies is nearly identical to that of the riparian brush rabbit. Presumably, suitable habitat restoration, expansion, and preservation for the San Joaquin Valley woodrat will also benefit the riparian brush rabbit.

OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to contribute to the recovery of at-risk native species in the Bay-Delta estuary and its watershed.

SPECIES TARGET: Protect the Caswell Memorial State Park Population; protect, enhance, and expand the species' Caswell Memorial Park population; and improve habitat connectivity and genetic interchange among isolated populations.

LONG-TERM OBJECTIVE: Establish San Joaquin Valley woodrat populations in riparian areas throughout its former range along the San Joaquin River.

SHORT-TERM OBJECTIVE: Increase the population sizes along the San Joaquin River in Stanislaus, Merced, and San Joaquin counties to the point where the woodrat will no longer be regarded as endangered.

RATIONALE: The San Joaquin Valley woodrat is a riparian-dwelling species whose distribution and ecology is poorly understood, but it apparently is confined to riparian areas in the San Joaquin Valley. It has been listed as endangered under the ESA and is a state Species of Special Concern. Because this population is known to exist in such a limited area in which most riparian habitat has been degraded, its long-term survival is likely to depend upon creation of more riparian habitat along the San Joaquin River, especially in Stanislaus, Merced, and San Joaquin counties. Any additional loss of habitat would have a significant negative impact on this species.

STAGE 1 EXPECTATIONS: A thorough survey of all riparian areas in the San Joaquin Valley will have been undertaken, both to identify the extent of existing populations and to identify habitats that would be good restoration sites for the woodrat and other riparian species. All precautions will have been taken to protect the existing populations from further decline.

RESTORATION ACTIONS

The following general targets will assist in meeting the implementation objective:

- Increase abundance in remaining population.
- Increase the number of woodrat populations.
- Increase the health of woodrats in the populations.

The following general programmatic actions will contribute to the recovery of the San Joaquin Valley woodrat:

- Expand the amount of riparian forest in the northern San Joaquin Valley and the Delta.

- Survey and map all riparian area along the San Joaquin River in its major tributaries.
- Increase the amounts of specific habitat features needed by woodrats in riparian forests where the existing population occurs or where introduced.
- Expand the amount of upland habitat adjacent to riparian habitat where the existing populations occur or to where new populations will be introduced.
- Develop in collaboration with owners of riparian land and local levee-maintenance districts incentive programs to preserve cover and riparian vegetation.
- Manage existing and new habitats to reduce potential threat of wildfire and human disturbance including hunting.
- Control predators where populations exist or will be introduced.

MSCS CONSERVATION MEASURES

The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would help achieve San Joaquin Valley woodrat habitat or population targets.

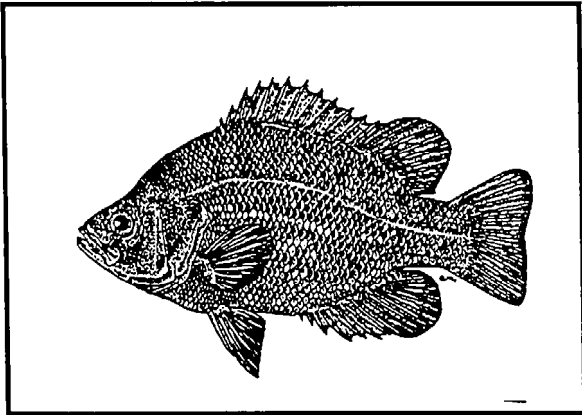
- Coordinate protection and restoration of San Joaquin Valley woodrat populations and its habitats with other federal and state programs (e.g., U.S. Fish and Wildlife Service species recovery plans and the Corps' Sacramento and San Joaquin Basin Comprehensive Study) that could affect management of occupied and historic habitat areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Direct ERP actions proposed for the Stanislaus River towards protecting, enhancing, and restoring suitable riparian and associated flood refuge habitats in and adjacent to occupied habitat at Caswell Memorial State Park.
- Direct ERP actions proposed for the San Joaquin River and its major tributaries within the current range of the species towards protecting and

enhancing existing occupied habitat areas; restoring suitable habitat adjacent to occupied habitat areas; and restoring suitable riparian habitat to create habitat corridors linking isolated populations.

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◆ SACRAMENTO PERCH



Sacramento Perch

INTRODUCTION

The Sacramento perch evolved in the Central Valley and is the only native sunfish in California and the only sunfish to evolve west of the Rocky Mountains (Moyle 1976). As a result of its isolation and lack of competition from other related species, it has retained many primitive structural and behavioral features. Given its historical lack of competition, it is not surprising that Sacramento perch have virtually disappeared from its native habitat following the introduction of a variety of sunfishes from the eastern United States.

Between 1888 and 1899, 40,000 to 432,000 pounds of Sacramento perch were sold annually in San Francisco. Sacramento perch are very rare today in the Delta. The decline, however, is probably not linked to harvest, but to three major stressors: habitat alteration or destruction, interspecific competition, and egg predation.

Sacramento perch are listed as a California species of special concern.

RESOURCE DESCRIPTION

Prior to development, Sacramento perch inhabited much of the Central Valley with sloughs, sluggish rivers, and lakes in the valley floor as their primary habitats. Sacramento perch evolved with the ability to withstand high turbidities, high temperatures, and high salinities and alkalinities, all relatively common in the waters of the Central Valley (Moyle 1976).

Like many other aquatic species, Sacramento perch were likely affected by the construction of levees, the draining of overflow "swamp lands", and general loss of historic habitat. During this period, sunfishes from the eastern United States were introduced in to the Central Valley as well as catfish and carp. All of these introduced species were more aggressive than the native Sacramento perch and the resulting interspecific competition for food and space contributed to the population decline. In addition, these introduced species were able to consume Sacramento perch eggs as the eggs were undefended by adult perch.



VISION

The vision for the Sacramento perch is to contribute to the recovery of this California species of special concern and contribute to the overall species richness and diversity.

Achieving this vision will reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

There are a number of programs that could potentially involve this species and restoration efforts will be coordinated with agencies that have responsibility for implementing programs to restore certain types of wetlands:

- U.S. Fish and Wildlife Service,
- California Department of Fish and Game (DFG),
- Delta Protection Commission,
- Wildlife Conservation Board.

Efforts to restore and maintain Sacramento perch would involve cooperation and support from other established programs that protect and improve conditions for the delta smelt, striped bass, and other species.

- The Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes.

- Central Valley Project Improvement Act will implement actions that will benefit the Sacramento perch.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

The reintroduction of Sacramento perch into selected habitats in the Central Valley is closely linked to restoration of non-tidal perennial aquatic habitats, Delta sloughs, and elimination of interspecific competitor or predator species. It may be feasible to link the reintroduction of Sacramento perch with efforts to reverse subsidence in certain Delta islands. One approach to reversing subsidence may be to flood sections of subsided land for the purpose of promoting the growth of aquatic vegetation such as cattails and tules, plants which can contribute organic matter for rebuilding peat. These shallow water, heavily vegetated experimental plots may provide ideal habitat to design an experiment that addresses the reintroduction of Sacramento perch.

OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to contribute to the recovery of at-risk native species in the Bay-Delta estuary and its watershed.

SPECIES TARGET: Establish multiple self-sustaining populations of Sacramento perch within the Central Valley.

LONG-TERM OBJECTIVE: Establish multiple, self-sustaining populations of Sacramento perch within the Central Valley region.

SHORT-TERM OBJECTIVE: Evaluate the status and biology of Sacramento perch to determine if restoration of wild populations within its native range is feasible.

RATIONALE: The Sacramento perch was once one of the most abundant fish in lowland habitats of the Central Valley. With the exception of a small population in Clear Lake, it has been extirpated from natural habitats within its native range, apparently because of competition and predation from introduced centrarchid fishes, such as black bass. It

would be certainly be formally listed as an endangered species except that it has been widely introduced into reservoirs, lakes, and ponds outside its native habitats in California and other western states. Although some of these introduced populations are probably secure, most are in artificial waters subject to dewatering and other perturbations and a number have disappeared in recent years. There is thus a need to establish populations in places within their native range that can be closely monitored to be sure this species persists in the future. It is quite likely that many, if not all, of these places will be artificial habitats (e.g., ponds, reservoirs).

STAGE 1 EXPECTATIONS: A thorough status review of the Sacramento perch will have been completed and a plan for its long-term preservation in the Central Valley developed. At least one experimental population will have been established in the Delta.

RESTORATION ACTIONS

Sacramento perch would benefit from the following actions and restoration activities:

- adding and modification of aquatic habitat,
- creation of tidally influenced wetlands,
- creation of set-back levees to increase shallow water habitat along existing channels,
- eliminating water hyacinth and other noxious aquatic plants from Delta channels,
- updating existing fish protection facilities at South Delta pumping plants,
- installing screens on unscreened diversions,
- removing competitors for similar habitats and food sources, and
- preventing further introductions of non-native aquatic organisms

MSCS CONSERVATION MEASURES

The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions that would

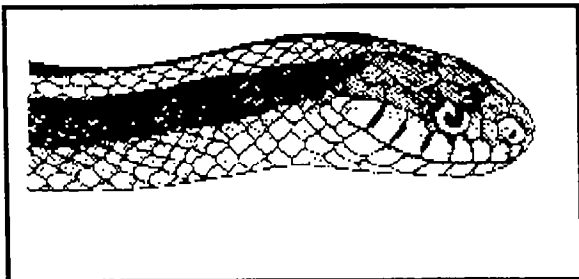
help achieve Sacramento perch habitat or population targets.

- Coordinate protection and restoration of Sacramento perch and its habitats with other federal and state programs (e.g., U.S. Fish and Wildlife Service species recovery plans) that could affect management of occupied and historic habitat areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- Implement reintroductions into suitable habitat areas and manage habitat areas to maintain introduced populations.

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◆ GIANT GARTER SNAKE



INTRODUCTION

The giant garter snake is a species that lives in the Central Valley of California. It inhabits sloughs, low-gradient streams, marshes, ponds, small lakes, agricultural wetlands, and other waterways, where it feeds on small fish and frogs during the active season. Populations of giant garter snake are found throughout much of the ERP study area including: the Feather River/Sutter Basin, Colusa Basin, Butte Basin, Yolo Basin, East Side Delta Tributaries, American River Basin, and portions of the Sacramento-San Joaquin Delta Ecological Management Zones. The status of giant garter snake in the San Joaquin Valley is unknown. The distribution and population of these species has declined substantially, primarily as a result of the loss or degradation of wetlands and nearby uplands. The loss of habitat and declining condition of these species' populations has warranted the listing of the giant garter snake as threatened under the State and federal Endangered Species Acts.

Major factors that limit these resources' contribution to the health of the Delta are related to adverse effects of conversion of aquatic, wetland, riparian, and adjacent upland habitats to other land uses and land use practices that degrade the value of otherwise suitable habitat areas.

RESOURCE DESCRIPTION

Historic habitat areas used by these species have been substantially reduced as a result of converting land for agriculture, urban, or industrial uses or degraded as a result of ongoing land-use practices. Remaining habitat areas, such as ponds, rivers, streams, lakes, marshes, and irrigation ditches, are largely fragmented. Associated uplands, used for reproduction and hibernation, are largely unavailable.

Upland habitats adjacent to aquatic habitats are now mostly isolated in small riparian bands along the tributaries that supply water to the Sacramento and San Joaquin Rivers and along canals with small levees.

Because much of the original habitat used by these species has been lost, irrigation canals and ditches (especially canals with nearby vegetation) now provide important replacement habitat for these species. Rice farming makes up a significant portion of the agricultural activity in the Sacramento Valley, and drainage ditches associated with rice farming practices provide much of this surrogate habitat. Adjacent breeding and hibernating cover, however, is often limiting for these species.

Other factors that limit these species populations include:

- some agricultural practices (e.g., discing, mowing, burning, and applying herbicides and rodenticides) that degrade habitat or cause mortality;
- introduced large predatory fish that prey on juveniles and injure adults; and
- mortality caused by flooding of hibernation sites during heavy rains, floods, or for waterfowl.



VISION

The vision for the giant garter snake is to contribute to the recovery of this State- and federally listed threatened species in order to contribute to the overall species richness and diversity.

Achieving this vision will reduce the conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

Protecting existing and restoring additional suitable wetland and upland habitats will be critical to achieving recovery of the giant garter snake. The ERPP's proposed restoration of aquatic, wetland, riparian, and upland habitats in the Sacramento-San Joaquin Delta Ecological Management Zone will help

in the recovery of these species by increasing habitat quality and area.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Restoration projects to improve upland and wetland agriculture and seasonal wetland and riparian habitats would be closely linked to the restoration of these species. The American River Basin is ecologically important because it contains the most stable populations of giant garter snakes. The Biological Resources Division of the USGS is presently studying stable populations of giant garter snakes that occur outside the American River Basin. These include populations in the Colusa-Basin (Sacramento and Colusa National Wildlife Areas), the Badger Creed areas of the Cosumnes River Preserve, and the Gilsizer Slough area of the Sutter Basin. Restoration and agricultural improvements will be developed for implementation both north and south of the Delta.

Efforts to recover giant garter snake populations will involve cooperation and support from other established programs aimed at restoring habitat and populations.

Wetland restoration and management programs that would improve habitat for these species include the Agricultural Stabilization and Conservation Service's Wetland Reserve Program, the Wildlife Conservation Board's Inland Wetlands Conservation Program, restoration programs administered by Ducks Unlimited and the California Waterfowl Association, and ongoing management of State and federal wildlife refuges and private duck clubs. Restoration efforts will be conducted in cooperation with agencies or organizations with responsibility or authority for restoring wetland and aquatic habitats, including DFG, California Department of Water Resources, USFWS, U.S. Army Corps of Engineers, and the Delta Protection Commission. USFWS is also preparing a recovery plan for the giant garter snake that will establish population recovery goals.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Restoration of ecosystem processes and habitats proposed by ERPP in other ecological management

zones will also allow natural floodplains, stream meanders, and seasonal pools to develop that assist in the recovery of their populations elsewhere in their historic ranges.

OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to contribute to the recovery of at-risk native species in the Bay-Delta estuary and its watershed.

SPECIES TARGET: Protect the existing population and habitat within the Delta Region, and restore, enhance, and manage suitable habitat areas adjacent to known populations to encourage the natural expansion of the species.

LONG-TERM OBJECTIVE: Establish or restore populations of giant garter snake in restored marshlands through out its original range.

SHORT-TERM OBJECTIVE: Maintain present populations with no further declines in size by ensuring that waterways known to being used by giant garter snakes have water in them year round.

RATIONALE: The giant garter snake is listed by both state and federal governments as a threatened species. Most of the original giant garter snake habitat, freshwater marshes, has been lost to agriculture. This snake resides in marsh habitat where there are pools and sloughs that exist year round to provide the frogs and invertebrates on which they feed. This snake survives today because small numbers live in rice fields and along irrigation ditches. Survival of the species, however, is likely to depend upon increasing its natural habitat through marsh restoration combined with special protection measures on the agricultural land it currently inhabits.

STAGE 1 EXPECTATIONS: Existing natural habitats that have available water all year will have been maintained, and key habitats in agricultural areas identified for special management. Sites for freshwater marsh restoration will have been identified and a restoration program established.